



PATENT

Case Docket No. ASMMC.057AUS

Date: June 23, 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s) : Leinikka et al.
Appl. No. : 10/810,415
Filed : March 25, 2004
For : SEED LAYER FORMATION
Examiner : Unknown
Group Art Unit : 2812

I hereby certify that this correspondence and all marked attachments are being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on

June 23, 2004

(Date)

Andrew N. Merickel, Reg. No. 53,317

TRANSMITTAL LETTER

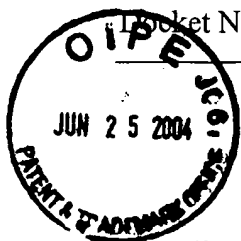
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Enclosed for filing in the above-identified application are:

- (X) An Information Disclosure Statement.
- (X) A PTO Form 1449 listing one-hundred fourteen (114) references.
- (X) Enclosed are sixty (60) references.
- (X) The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Account No. 11-1410.
- (X) Return prepaid postcard.

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INFORMATION DISCLOSURE STATEMENT

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Enclosed is form PTO-1449 listing 114 references. Copies of disclosed U.S. patents and/or publications are not included pursuant to PTO waiver of the requirement under 37 C.F.R. § 1.98(a)(2)(i) for applications filed after June 30, 2003. Copies of other references are enclosed.


This Information Disclosure Statement is being filed within three months of the filing date of this application and no fee is required in accordance with 37 C.F.R. § 1.97(b)(1), (b)(2), or (b)(4).

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: June 23, 2004

By: Andrew N. Merickel
Andrew N. Merickel
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FORM PTO-1449 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE  INFORMATION DISCLOSURE STATEMENT BY APPLICANT (USE SEVERAL SHEETS IF NECESSARY)	ATTY. DOCKET NO. ASMMC.057AUS	APPLICATION NO. 10/810,415
	APPLICANT Leinikka et al..	
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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE (IF APPROPRIATE)
	1.	3,708,728	1/2/73	Sterling et al.			
	2.	4,058,430	11/15/77	Suntola et al.			
	3.	4,565,747	1/21/86	Nakae et al.			
	4.	4,935,661	6/19/90	Heinecke et al.			
	5.	5,281,274	01/25/94	Yoder			
	6.	5,306,666	4/26/94	Izumi			
	7.	5,316,793	05/94	Wallace			
	8.	5,342,652	08/30/94	Foster et al.			
	9.	5,382,333	1/17/95	Ando et al.			
	10.	5,438,028	8/1/95	Weissman et al.			
	11.	5,595,784	1/21/97	Kaim et al.			
	12.	5,603,771	2/18/97	Seiberras et al.			
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	19.	5,916,365	06/29/99	Sherman			
	20.	5,946,598	8/31/99	Yeh			
	21.	5,964,943	10/12/99	Stein et al.			
	22.	5,972,430	10/26/99	DiMeo, Jr. Et al.			
	23.	6,006,763	12/28/99	Mori et al.			
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	25.	6,087,257	7/11/00	Park et al.			
	26.	6,099,904	8/8/00	Mak et al.			
	27.	6,156,382	12/5/00	Rajagopaian et al.			
	28.	6,162,501	12/19/00	Kim			

EXAMINER	DATE CONSIDERED
*EXAMINER: INITIAL IF CITATION CONSIDERED, WHETHER OR NOT CITATION IS IN CONFORMANCE WITH MPEP 609; DRAW LINE THROUGH CITATION IF NOT IN CONFORMANCE AND NOT CONSIDERED, INCLUDE COPY OF THIS FORM WITH NEXT COMMUNICATION TO APPLICANT.	

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U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE (IF APPROPRIATE)
	29.	6,203,613	3/20/01	Gates et al.			
	30.	6,206,967	3/27/01	Mak et al.			
	31.	6,284,646	9/4/01	Leem			
	32.	6,287,965	09/11/01	Kang et al.			
	33.	6,342,277 B1	1/29/02	Sherman			
	34.	6,355,561	3/12/02	Sandhu et al.			
	35.	6,380,627	4/30/02	Weihs et al.			
	36.	6,416,577	7/9/02	Suntola et al.			
	37.	6,482,733	11/19/02	Raaijmakers et al.			
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	40.	6,576,053	6/10/03	Kim et al.			
	41.	6,616,982	9/9/03	Merrill et al.			
	42.	6,652,924	11/25/03	Sherman			
	43.	US 2003/0032281	2/13/03	Werkhoven et al.			
	44.	US 2003/0049931 A1	3/13/03	Byun et al.			
	45.	US 2003/0104126 A1	6/5/03	Fang et al.			
	46.	US 2003/0123216 A1	7/3/03	Yoon et al.			
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	48.	US 2003/0153181 A1	8/14/03	Yoon et al.			
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	50.	US 2003/0161952 A1	8/28/03	Wang et al.			
	51.	US 2003/0165615	9/4/03	Aaltonen et al.			
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	53.	US 2003/0194825 A1	10/16/03	Law et al.			
	54.	US 2003/0203616 A1	10/30/03	Chung et al.			

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FOREIGN PATENT DOCUMENTS								
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
							YES	NO
	55.	EP 0 387 403 A1	10/20/89	EPO				
	56.	EP 0 394 054 A1	4/20/90	EPO				
	57.	EP 0 442 490 A1	08/21/91	EPO				
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	62.	JP 6037041	2/10/94	Japan				
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	65.	JP 8 264 530 A	10/11/96	Japan Abstract				
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	67.	WO 98/51838	11/19/98	PCT				
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	69.	WO 00/47404	2/11/00	PCT				
	70.	WO 00/47796	08/17/00	PCT				
	71.	WO 00/54320	9/14/00	PCT				
	72.	WO 01/27347	4/19/01	PCT				
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	78.	WO 01/78123	10/18/01	PCT				
	79.	WO 01/88972	11/22/01	PCT				
	80.	WO 96/17107	6/6/96	PCT				
	81.	WO 96/18756	06/20/96	PCT				

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82.	WO 98/51838	11/19/98	PCT				
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EXAMINER INITIAL	OTHER DOCUMENTS (INCLUDING AUTHOR, TITLE, DATE, PERTINENT PAGES, ETC.)	
	83.	"Kirk-Othmer Encyclopedia of Chemical Technology," 4 th Edition, Vol. 4, John Wiley & Sons, Inc. pp. 841-878, (1992).
	84.	Andriacacos et al., "Damascene copper electroplating for chip," <u>IBM Jour. Research and Dev.</u> , 42:567 (1998).
	85.	Bain et al., "Deposition of tungsten by plasma enhanced chemical vapour deposition," <u>J. Phys. IV France</u> , Vol. 9, pp. 827-833 (1999)
	86.	Elers et al., "NbC15 as a precursor in atomic layer epitaxy," <u>Applied Surface Science</u> , 82/83:468-474 (1994).
	87.	Girolami, Gregory S., James A. Jensen, John E. Gozum, and Deborah M. Pollina, "Tailored Organometallics as Low-Temperature CVD Precursors to Thin Films," <u>Materials Research Society Symposium Proceedings</u> , Vol. 121, pp. 429-438, (1988).
	88.	Helmut Tullhoff, Hermann C. Starck, and Werk Goslar, "Ullmann's Encyclopedia of Industrial Chemistry," 5th, Completely Revised Edition, Vol. A5, pp. 61-77, (1986).
	89.	Hermann Jehn, Gudrun Bär, Erich Best, and Ernst Koch, "Gmelin Handbook of Inorganic and Organometallic Chemistry," 8 th Edition, Vol. A 5b, No. 54, pp. 131-154, (1993).
	90.	Hiltunen et al., "Nitrides of titanium, niobium, tantalum and molybdenum grown as thin films by the atomic layer epitaxy method," <u>Thin Solid Films</u> , 166:149-154 (1988).
	91.	Jeon, H., "A Study on the Characteristics of TiN Thin Film Deposited by Atomic Layer Chemical Vapor Deposition Method," <u>AVS 46th International Symposium</u> , Seattle, WA, abstract TF-MoP17 (1999)
	92.	Jeon, H., et al., "A Study on the Characteristics of TiN Thin Film Deposited by Atomic Layer Chemical Vapor Deposition Method," <u>J. Vac. Sci. Technol. A</u> , 18(4), 1595-1598 (2000)
	93.	Juppo et al., "Deposition of copper films by an alternate supply of CuCl and Zn," <u>J. Vac. Sci. Technol. A</u> , Vol. 15, No. 4, pp. 2330-2333, (July/August 1997).
	94.	Klaus et al., "Atomic Layer Deposition of Tungsten Nitride Films Using Sequential Surface Reactions," <u>Journal of the Electrochemical Society</u> , Vol. 147, No. 3, pp. 1175-1181, (2000).
	95.	Klaus et al., "Atomic layer deposition of tungsten using sequential surface chemistry with a sacrificial stripping reaction," <u>Thin Solid Films</u> , Vol. 360, pp. 145-153, (2000).
	96.	Klaus, J.W., et al., "Atomic layer deposition of tungsten and tungsten nitride using sequential surface reactions," <u>AVS 46th International Symposium</u> , Seattle, WA, abstract TF-TuM6 (1999)
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	98.	Lai, Ken K. and H. Henry Lamb, "Precursors for Organometallic Chemical Vapor Deposition of Tungsten Carbide Films," <u>Chem. Mater.</u> , Vol. 7, pp. 2284-2292, (1995).
	99.	Leskelä et al., "ALD precursor chemistry: Evolution and future challenges," <u>Jour. Phys. IV France</u> 9, pp. 837-852 (1999).
	100.	Ludviksson et al., "Low-Temperature Thermal CVD of Ti-Al Metal Films Using a Strong Reducing Agent," <u>Chem. Vap. Deposition</u> , Vol. 4, No. 4, pp. 129-132, (1998)

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	101.	Martensson et al., "Atomic Layer Epitaxy of Copper and Tantalum," <u>Chemical Vapor Deposition</u> , Vol. 3, No. 1, pp. 45-50, (1997)
	102.	Martensson et al., "CU(THD) ₂ As Copper Source in Atomic Layer Epitaxy," <u>Electrochemical Society Proceedings</u> , Vol. 97-25, pp. 1529-1536
	103.	Martensson, "Use of atomic layer epitaxy for fabrication of Si/TiN/Cu structures," <u>J. Vac. Sci. Technol. B</u> , Vol. 17, No. 5, pp. 2122-2128, (Sept./Oct. 1999)
	104.	Min, Jae-Sik, Young Woong Son, Won-Gu Kang, Soung-Soon Chun, and Sang-Won Kang, "Atomic Layer Deposition of TiN Films by Alternate Supply of Tetrakis (ethylmethylamino)-Titanium and Ammonia," <u>Jpn. J. Appl. Phys.</u> , Vol. 37, pp. 4999-5004, (1998).
	105.	Min, Jae-Sik, Young-Woong Son, Won-Gu Kang, and Sang-Won Kang, "Atomic Layer Deposition of TiN Thin Films by Sequential Introduction of Ti Precursor and HN ₃ ," <u>Mat. Res. Soc. Symp. Proc.</u> , Vol. 514, pp. 337-342, (1998).
	106.	Nakajima, Tsuyoshi and Toru Shirasaki, "Chemical Vapor Deposition of Tungsten Carbide, Molybdenum Carbide Nitride, and Molybdenum Nitride Films," <u>J. Electrochem. Soc.</u> , Vol. 144, No. 6, pp. 2096-2100, (June 1997)
	107.	Polyakov et al., "Growth of GaBN Ternary Sololutions by Organometallic Vapor Phase Epitaxy," <u>Journal of Electronic Materials</u> , Vo. 26, No. 3, pp. 237-242, (1997)
	108.	Ritala et al., "Atomic layer epitaxy growth of TiN thin films," <u>J. Electrochem. Soc.</u> , 142(8):2731-2737 (1995)
	109.	Ritala, Mikko, Markku Leskelä, Eero Rauhala, and Janne Jokinen, "Atomic Layer Epitaxy Growth of TiN Thin Films from TiI ₄ and NH ₃ ," <u>J. Electrochem. Soc.</u> , Vol. 145, No. 8, pp. 2914-2920, (August 1998)
	110.	Ritala et al., "Effects of intermediate zinc pulses on properties of TiN and NbN films deposited by atomic layer epitaxy," <u>Appl. Surf. Sci.</u> , 120:199-212 (1997).
	111.	Ritala et al., "Perfectly conformal TiN and Al ₂ O ₃ films deposited by atomic layer deposition," <u>Chem. Vapor Deposition</u> , 5:7-9 (1999).
	112.	Ryu et al., "Barriers for copper interconnections," <u>Solid State Technology</u> , April, 53 (1999).
	113.	Sherman et al., "Plasma enhanced atomic layer deposition of Ta for diffusion barrier applications," AVS 46 th International Symposium, Paper TF-TuM5 (abstract), (October 26, 1999), Seattle, WA.
	114.	Yang et al., "Atomic Layer Deposition of Tungsten Film from WF ₆ /B ₂ H ₆ : Nucleation Layer for Advanced Semiconductor Devices," Advanced Metallization Conference 2001 (AMC 2001), Conference Proceedings ULSI XVII@2002 Materials Research Society, pp. 655-660.

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